US5608629:Vehicle crash data generator

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Abstract:

Crash data from actual vehicle crashes is manipulated to produce new hybrid crash data which contains different acceleration peaks while retaining the overall characteristics of the original crash data. The new crash data is realistic and can be used to test or verify crash management components such as airbag deployment sensors and to demonstrate the robustness of components to different crashes without the expense of running another crash test.

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What is claimed is:

1. A method of obtaining crash data from vehicle crashes comprising the steps of:

- recording first acceleration signals during a crash of a first vehicle;
- recording second acceleration signals during a crash of a second vehicle;
- generating a first frequency domain signal by filtering and transforming said first acceleration signals, said first frequency domain signal
- being substantially limited to frequencies below a predetermined cutoff frequency;
- generating a second frequency domain signal by filtering and transforming said second acceleration signals, said second frequency
- domain signal being substantially limited to frequencies above said predetermined cutoff frequency;
- adding said first frequency domain signal and said second frequency domain signal to produce a composite signal; and
- inverse transforming said composite signal to generate hybrid crash data having characteristics of both of said crashes of said first
- vehicle and said second vehicle.

Background/Summary:

BACKGROUND OF THE INVENTION

The present invention relates in general to testing of transportation vehicles, and more specifically to generating realistic crash data sets from other crash data sets without the expense of running another crash test.

In developing new vehicle models, automotive manufacturers conduct extensive crash testing. Such crash testing facilitates the design, validation, and testing of occupant restraint and other crash protection systems. In addition, government regulations require extensive impact testing of vehicles. Thus, an automotive manufacturer may conduct hundreds of vehicle crash tests each year.

Accelerometers in a test vehicle measure instantaneous acceleration at various locations within the vehicle during a crash. The accelerometer signals are each recorded separately using a data acquisition system. Many vehicles of an identical model are typically tested at various speeds and crash modes. Examples of crash modes are head on-collision with a barrier, slanted impact with a barrier, offset impact with another vehicle, and head on-collision with a pole. Crash testing of a single vehicle model typically includes more than one crash test at the same speed and same crash mode.

Accelerometers are used as crash sensors in production vehicles for deploying airbags, for example. Recorded data sets from crash tests provide information allowing development of a deployment procedure or algorithm used in a microprocessor to detect an occurrence of acceleration corresponding to impacts of such a type and severity that an airbag should be inflated. The microprocessor sends a firing signal to the airbag when it detects an acceleration corresponding to such an impact. The deployment procedure is developed for recognizing these events based on the data sets collected during crash testing of prototype vehicles. The crash data sets are collected from an accelerometer

mounted at the same location within the prototype vehicle as the location where the production accelerometer will be mounted.

The data collected during the numerous crash tests fully characterize the crash performance of the vehicle. Nevertheless, even at the same crash mode and speed there are minor variations in instantaneous acceleration from crash to crash. Therefore, in order to further improve the robustness of a deployment procedure, an increased number of data sets for use in system development and validation would be useful.

SUMMARY OF THE INVENTION

The present invention has the advantage of creating realistic data sets for system development and validation of a crash sensor that accurately simulates a crash of a vehicle without requiring an additional crash test.

In one aspect, the present invention provides a method of obtaining crash data from vehicle crashes wherein first acceleration signals are recorded during a crash of a first vehicle and second acceleration signals are recorded during a crash of a second vehicle. A first frequency domain signal is generated by filtering and transforming the first acceleration signals, the first frequency domain signal being substantially limited to frequencies below a predetermined cutoff frequency. A second frequency domain signal is generated by filtering and transforming the second acceleration signals, the second frequency domain signal being substantially limited to frequencies above the predetermined cutoff frequency. The first frequency domain signal and the second frequency domain signal are added to produce a composite signal. The composite signal is inverse transformed to generate hybrid crash data having characteristics of both of the crashes of the first vehicle and the second vehicle.